

**Responses to EPA Comments on April 1994
Draft Final Technical Memorandum #11
Development and Screening of Remedial Action Alternatives
881 Hillside Area (Operable Unit 1)
Rocky Flats Plant**

General Comments

Comment 1

The document appropriately refers to the OU 1 Phase III RFI/RI Report for details of the site history and characterization. Nevertheless, some discussion is needed near the beginning of this document regarding the existing source of groundwater contamination at OU 1. In particular this should address the most probable location of solvents at 119 1, such as residuals in vadose zone soils and/or DNAPL pools at the top of bedrock. The uncertainty of such interpretations should also be addressed qualitatively. The effectiveness evaluation of each alternative should also focus on source removal or reduction as well as ground water remediation.

Response

The OU 1 CMS/FS Report includes more substantial background information including site history and characterization information derived from the Final OU 1 Phase III RFI/RI Report. Sources of groundwater contamination and their locations are likewise discussed in greater detail. Contaminant concentrations, areal and vertical extent of contamination, and contaminant partitioning and dispersion are discussed under the fate and transport summary, and under groundwater modeling. Discussions on the possible existence and probable locations of DNAPLs as well as on vadose zone contamination, are included in the RFI/RI summary sections.

Comment 2

The document should more clearly explain why certain process options were selected for inclusion in alternatives and others were not. The rationale for developing alternatives [is] unclear. Due to the innate advantages of in situ treatment and rapidly evolving technological development in this area, EPA is especially interested in evaluating process options such as bioremediation, permeable reaction wells, permeable treatment beds, and air sparging. Therefore solid rationale must be clearly stated if any of these options are to be screened out from further analysis.

Response

Serious consideration was given to a number of in situ technologies including those enumerated in this comment. Bioremediation was screened out from further consideration during the initial screening of technologies due to site conditions and contaminant properties which make it

ineffective and unimplementable Due to the variable groundwater table permeable treatment beds and air sparging are not considered viable options at OU 1 Permeable reaction wells were not considered due to historical low recoveries from extraction wells Also any water collected by wells would be cost-effectively treated by the existing IM/IRA water treatment system Soil Vapor Extraction (SVE) and RF/Ohmic heating which are both innovative in situ technologies were carried through the screening process and into detailed analysis More discussion appears in the final CMS/FS Report as to the screening criteria alternative development rationale and the basis of technology exclusion/inclusion

Comment 3

To provide a range of alternatives as prescribed by guidance, alternatives that include some intermediate actions should be developed in the document for evaluation in the detailed analysis of alternatives

Response

Two additional alternatives which represent more intermediate actions are now carried through detailed analysis See the OU 1 CMS/FS Report for a complete description of these alternatives

Comment 4

The existing interim measure/interim remedial action (IM/IRA) water treatment system is included in the majority of remedial alternatives developed The text should state that this system may require modifications to provide adequate treatment of extracted groundwater, especially in light of the fact that it was recently determined to be ineffective in treating carbon tetrachloride at a concentration of 100 ppb

Response

Text referring to the existing IM/IRA water treatment system in the CMS/FS Report includes a discussion of the potential need for modification of the system to adequately treat site contaminants Modifications such as changing the frequency of the UV flash lamps will be explored as well as modifications required to make the system compatible with contaminants from other OUs

Comment 5

Cost estimates for each of the alternatives developed should be included in the alternatives screening section for comparison purposes

Response

Cost estimates used for alternative screening prior to detailed analysis are based on the relative cost comparisons of technologies given in Figure 2-4 p 2 17 (see T M #11) Although rough

numerical cost estimates are indicated by EPA guidance the purpose of the cost estimates during screening is to provide a relative cost level for each alternative with respect to the other alternatives Due to site specific conditions and the limited impact of cost on the screening outcome for this specific site, the qualitative cost estimate levels of low, moderate, and high were considered sufficient for screening purposes Since there will be no revision of this document published incorporating agency comments and detailed analysis is to begin immediately, numerical cost estimates will not be included in the initial screening The relative cost estimates are considered adequate for alternative screening as they yield back of the envelope relative costs for the various alternatives as composites of their constituent technologies Cost was not a significant consideration in the screening of alternatives since effectiveness and implementability ranged greatly Alternatives which were deemed effective and implementable survived the initial steps of alternative screening Alternatives were screened on the basis of marginal utility of treatment, meaning a cost benefit analysis was performed to determine if additional treatment was appropriate Alternatives which yielded virtually no additional protectiveness with increased costs were screened out Those alternatives which survived the screening process were carried through detailed analysis Detailed cost estimates are included in the detailed analysis of alternatives

Specific Comments

Comment 1

Figure 2 3 Page 2 11 The general response action of containment presented in this figure needs several revisions The descriptions of grout curtains, sheet pilings, and cryogenic barriers indicate that they should be listed as process options for horizontal subsurface flow control instead of as vertical subsurface flow controls The impermeable fabric that is in place as part of the IM/IRA, extending upwards from the french drain, should also be listed as a horizontal flow control process option Since the IM/IRA will be included in the detailed analysis, horizontal subsurface flow control should not be screened out as depicted by this figure Grout injection should be listed as a possible vertical flow control process option instead of as horizontal flow control

Response

EPA guidance entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, page 4 17 shows grout curtains and similar containment technologies as vertical barriers This is the basis for naming the technology type as vertical subsurface flow control The vertical refers to the orientation of the barrier not to the direction of the flow it is meant to control The impermeable fabric included in the existing IM/IRA system is considered part of the french drain which is included in the screening as subsurface drains rather than a separate containment technology French drains are typically installed with such a barrier to ensure that flow does not pass over the drain Since this barrier is an integral part of any french drain installation, it is not a separate containment technology Grout is considered in the screening as a vertical subsurface flow control under the name Grout Curtains

as well as a horizontal subsurface flow control under the name Grout Injection

Comment 2

Figure 2 3 Page 2 14 This figure presents the initial screening of technologies and process options In the initial screening step technologies and process options are to be evaluated on technical implementability Two process options freeze crystallization and evaporation, were eliminated based on cost Process options should not be eliminated based on cost in the initial screening step of the feasibility study (FS) process

Response

The effectiveness of freeze crystallization and evaporation for any reasonable energy input is extremely low for compounds at low concentrations Technically impractical energy inputs must be made to achieve even moderate effectiveness in such a case Thus the technologies were screened out based on technical implementability due to the difficulties in supplying sufficient energy to achieve acceptable effectiveness

Comment 3

Page 2 16 Section 2 3 3 As stated above in general comment 4, the UV/peroxide treatment system has actually been shown to not be effective for carbon tetrachloride Therefore, use of this system would most likely require some modification for this and possibly other contaminants The exact details need not be specified here, however the statement that it is proven to be effective in treating the contaminants must be revised The Systems Operation and Optimization Test Report was apparently used by DOE to conclude that the system is effective That document, however, only presented data from the initial months of operation, none of which included substantial concentrations of contaminants

Response

As stated in the response to general comment 4 more discussion on the potential need for modification to the existing IM/IRA water treatment system is included in the CMS/FS Report Recent information on the effectiveness of the system on site contaminants, particularly carbon tetrachloride will be assimilated and used to explore possible modifications to the system in the future

Comment 4

Figure 2-4 Page 2 18, Air Sparging This figure presents the evaluation of process options Under the effectiveness comment for air sparging, it should be stated that off gas collection and treatment is required as is stated for RF/Ohmic Heating Also, under the implementability comment it states that horizontal drilling is required It should be clarified that air sparging can be accomplished with either vertical drilling or horizontal drilling

Response

The need for off gas treatment for air sparging will be included in the effectiveness comment of the Final OU 1 CMS/FS Report to remain consistent with the screening of other technologies. The implementability will reflect the possibility of both horizontal and vertical drilling by deleting the word horizontal from the comment.

Comment 5

Figure 2-4 Page 2 18 Activated Carbon This figure presents the evaluation of process options. It states that activated carbon is effective only if used as a final polishing step. Activated carbon can be effective as a primary treatment for many organic compounds and the screening comments should reflect this.

Response

The effectiveness comment will be changed in the final OU 1 CMS/FS Report to reflect the applicability of carbon as a primary as well as secondary treatment. The site contaminants, however, have an extremely high breakthrough rate in carbon which makes its effectiveness difficult to ensure when used as a primary treatment.

Comment 6

Table 3 1 Page 3 3 This table presents a summary of the development of groundwater remedial action alternatives. This table should include soil vapor extraction (SVE) as a process option under the removal general response action since it is part of alternatives 4a and 4b.

Response

Removal generally refers to removal of the contaminated media in order to treat it and remove contamination. SVE is not considered a removal technology since it does not remove the soil or groundwater media that it potentially treats. SVE is listed as an in-situ technology for the treatment of chlorinated solvents since it is an in situ method of separating the contamination from the affected media. EPA demonstration programs consistently refer to SVE as an in situ treatment option.

Comment 7

Section 3 0 This section discusses the development and screening of remedial action alternatives for OU 1. Two additional alternatives should be developed in this section to provide more in the intermediate range of alternatives in the FS. One alternative is to modify the current groundwater extraction and treatment system to concentrate on the contamination found in individual hazardous substance site (IHSS) 119 1. The second alternative is SVE with groundwater pumping for dewatering. SVE is a proven and effective technology for removing chlorinated solvents from soils and dewatered aquifer materials.

Response

As stated in the response to general comment 3 two additional alternatives are included in the detailed analysis of alternatives. These alternatives are Alternative 3 Modified French Drain with Additional Extraction Wells and Alternative 4 Groundwater Pumping and Soil Vapor Extraction. These alternatives represent intermediate actions in treatment of the site and thus provide a greater range of alternatives for detailed analysis.

Comment 8

Page 3 9 Section 3 3 Alternative 2 is labeled limited action, but this is misleading since it actually involves an entire groundwater collection and treatment system. Although most of this system is already in place, the alternative should be renamed to reflect the action and technology being employed.

Response

The alternative has been renamed to Alternative 3 Modified French Drain with Additional Extraction Wells, in order to reflect the nature of the actions being proposed under this alternative.

Comment 9

Page 3 10 The effectiveness evaluation for this system was too simplistic and did not take into consideration the more recent information that is available on relatively minor improvements that could be made to the system. Unfortunately, the collection well has never operated efficiently, and this has contributed to the perception that the overall system is ineffective in collecting contaminated groundwater. Besides repairing the existing well, consideration should be given to placement of one or more additional wells for increased recovery of the most contaminated ground water. As stated above, the data that was used to judge effectiveness of this system were only from the initial months of operation. Consideration should also be given to optimizing this system so that it would collect only water needing remediation. This could be done by discontinuing collection of the 881 footing drain water and limiting the active french drain to only an area down gradient of 119 1. Therefore this alternative should probably include additional extraction wells and a more focused collection of groundwater, in only the area affected by releases from 119 1.

Response

Additional discussion on the effectiveness of the existing IM/IRA water treatment system and potential modifications to increase effectiveness are included in the CMS/FS Report. An alternative with focused groundwater collection is included in response to specific comment 7.

Comment 10

Page 3 11, first sentence (incomplete) Although the tank coatings in the effluent storage tanks may have contributed to contaminant concentrations in the treated water, none of the concentrations have ever exceeded discharge standards It is EPA s understanding that the contaminants from tank coatings decreased significantly from the levels that occurred during the initial months of operation Nevertheless, if this is a problem it seems that it could be corrected as a modification to optimize the existing system This statement must be revised

Response

This statement has been revised in the CMS/FS Report to reflect more recent data on the operations of the existing IM/IRA water treatment system The system is currently capable of addressing contaminants found in OU 1 at the concentrations seen in the French Drain system The system will be evaluated to determine if other OU contaminants may necessitate some modifications to the system